

REMARKS

Status of the Claims:

Claims 41 – 73 are currently pending.

Claims 70 and 73 are currently cancelled. Claims 1 – 40 were previously cancelled.

Claims 50 – 67 and 71 – 72 are withdrawn from consideration.

Claims 41 – 43, 49, 68 and 69 are currently amended. Claims 50, 52 – 54, 56 – 59, 65 – 67, 71 and 72 are withdrawn and currently amended.

Amendments to the Claims:

No new matter has been introduced by way of the claim amendments.

Claims Presently Under Consideration:

Claims 41 – 43 and 49 are presently amended to replace the abbreviations CNTs and SWNTs with carbon nanotubes and single-wall carbon nanotubes, respectively.

Claim 68 is presently amended to recite that the carbon nanotubes are hydroxyl-functionalized carbon nanotubes that have been further silane functionalized, and wherein the hydroxyl-functionalized carbon nanotubes are prepared by reacting fluorinated carbon nanotubes with a reagent selected from the group consisting of a mono-metal salt of an alcohol, a mono-metal salt of a multi-alcohol and an amino alcohol. Support for the amendments to claim 68 may be found in at least paragraphs [0055], [0057], [0058] and [0063] of the specification. The specific structural formulas previously presented in claim 68 have been deleted.

Claim 69 is presently amended to recite that the hydroxyl-functionalized carbon nanotubes are further functionalized with a silation reagent selected from the group consisting of a silanol and a chlorosilane. Support for this amendment may be found in at least paragraphs [0060], [0063] and [0064]. The Markush group of R group selections previously presented in claim 68 has been deleted.

Claims Withdrawn From Consideration:

Withdrawn claims 50, 52, 53, 54, 56 – 59 and 65 – 67 are presently amended to replace the abbreviations CNTs, MWNTs and SWNTs with carbon nanotubes, multi-wall carbon nanotubes and single-wall carbon nanotubes, respectively. Claims 50 and 56 are also presently amended for stylistic purposes.

Withdrawn claim 71 is presently amended to recite that the carbon nanotubes are hydroxyl-functionalized carbon nanotubes that have been further silane functionalized, and wherein the hydroxyl-functionalized carbon nanotubes are prepared by reacting fluorinated carbon nanotubes with a reagent selected from the group consisting of a mono-metal salt of an alcohol, a mono-metal salt of a multi-alcohol and an amino alcohol. Support for the amendments to claim 71 may be found in at least paragraphs [0055], [0057], [0058] and [0063] of the specification. The specific structural formulas previously presented in claim 71 have been deleted.

Withdrawn claim 72 is presently amended to recite that the hydroxyl-functionalized carbon nanotubes are further functionalized with a silation reagent selected from the group consisting of a silanol and a chlorosilane. Support for this amendment may be found in at least paragraphs [0060], [0063] and [0064]. The Markush group of R group selections previously presented in claim 72 has been deleted.

I. Claim Objections

The Examiner has objected to claims 41 – 49 and 68 – 70 on the grounds that the abbreviations CNT (carbon nanotubes) and SWNT (single-walled carbon nanotubes) are present. Office Action page 2, item 2. The Examiner alleges that the claims should not recite abbreviations for claimed structural limitations, since the abbreviations may be known in the art as representing various structures.

Claims 41 – 44, 49, 50, 52 – 54, 56 – 59, 65 – 68 and 70 presently recite abbreviations of CNTs, SWNTs or MWNTs. Applicants have amended these claims to replace the abbreviations CNT with carbon nanotube, SWNT with single-wall carbon nanotube and MWNT with multi-

wall carbon nanotube. Applicants respectfully request that the objection to the claims be withdrawn.

II. 35 U.S.C. § 112 Rejections

II.1 35 U.S.C. § 112, First Paragraph Rejections

Claims 68 – 70 are rejected under 35 U.S.C. § 112, First Paragraph for allegedly failing to comply with the written description requirement for not being described in the specification in such a way as to reasonably convey to one skilled in the art that the inventor had possession of the claimed invention at the time the application was filed. Office Action page 2, item 4. Specifically, the Examiner alleges that the structures of claim 68 are not supported by the specification.

Applicants have amended claim 68 to recite that the carbon nanotubes are hydroxyl-functionalized carbon nanotubes that have been further silane functionalized. The hydroxyl-functionalized carbon nanotubes are prepared by reacting fluorinated carbon nanotubes with a reagent selected from the group consisting of a mono-metal salt of an alcohol, a mono-metal salt of a multi-alcohol and an amino alcohol. Applicants have also amended claim 69 to recite that the further silane functionalization takes place with a silation reagent selected from the group consisting of a silanol and a chlorosilane. The specific structural formulas of claim 68 have been deleted. Applicants have also made similar amendments in withdrawn claims 71 and 72. Claims 70 and 73 have been cancelled, rendering their rejection moot.

Applicants respectfully assert that the carbon nanotubes of amended claims 68, 69, 71 and 72 are supported by the specification within the meaning of 35 U.S.C. § 112, First Paragraph, and respectfully request that the rejection be withdrawn.

II.2 35 U.S.C. § 112, Second Paragraph Rejections

Claims 68 – 70 are rejected under 35 U.S.C. § 112, Second Paragraph, for allegedly failing to particularly point out and distinctly claim the subject matter regarded as the invention. Office Action page 3, item 6. The Examiner alleges that the scope of the formulas entailed by

the variables R, R¹, R², R³ and n is unclear, since the claim does not recite values associated with these constituents.

As noted above in Applicants' response to the 35 U.S.C. § 112, First Paragraph rejections, claims 68, 69, 71 and 72 have been amended as previously set forth. Claims 70 and 73 have been cancelled, rendering their rejection moot. The variables that rendered claims 68, 69, 71 and 72 indefinite under 35 U.S.C. § 112, Second Paragraph, have been deleted.

Applicants respectfully assert that the carbon nanotubes of amended claims 68, 69, 71 and 72 are not indefinite according to 35 U.S.C. § 112, Second Paragraph, and respectfully request that the rejection be withdrawn. .

II. 35 U.S.C. § 102/103 Rejections Over *Ton-That*

Claims 41, 42, 45 and 47 stand rejected under 35 U.S.C. § 102(e) as anticipated by or, in the alternative, obvious under 35 U.S.C. § 103(a) in view of United States Patent publication 2005/0191490 (hereinafter, *Ton-That*). Office Action page 4, item 8. Applicants respectfully traverse the rejection of these claims on the grounds that all of the claim limitations are not taught or suggested by this reference.

II.I Standard of Review

The standard of review for establishing anticipation under 35 U.S.C. § 102 is set forth as follows: "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987); MPEP § 2131.

For rejections made under 35 U.S.C. § 103(a), all claim limitations must be taught or suggested by the prior art to establish obviousness. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974). Furthermore, "[r]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness". *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1741 (2007) citing with approval *In re Kahn*, 441 F.3d 977, 988 (CA Fed.

2006). Likewise, in issuing rejections under 35 U.S.C. § 103(a), the Examiner must consider an invention and the prior art as a whole in accordance with the requisite *Graham* factual inquiries. M.P.E.P. § 2141; *Ruiz v. A.B. Chance Co.* 69 U.S.P.Q.2d 1686, 1690 (Fed. Cir. 2004).

Furthermore, "[a] rationale to support a conclusion that a claim would have been obvious is that all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded nothing more than predictable results to one of ordinary skill in the art." M.P.E.P. § 2143.02. Although "[o]bviousness does not require absolute predictability...at least some degree of predictability is required." *Ibid.*

II.2 Examiner's Grounds for Rejection

The Examiner alleges that *Ton-That* teaches a composite material comprising carbon nanotubes, a fiber reinforcement material and a polymer in which the carbon nanotubes chemically bind the fiber reinforcement material to the polymer. The Examiner also alleges that silane functionalization of carbon nanotubes, glass fibers and an epoxy polymer are taught.

II.3 Claims 41, 42, 45 and 47 Are Not Anticipated or Obvious

Applicants respectfully assert that claims 41, 42, 45 and 47 are not obvious, because *Ton-That* does not teach, either expressly or inherently, or suggest all of the limitations of independent claim 41. Specifically, the Examiner broadly alleges that *Ton-That* teaches a polymer composite in which carbon nanotubes chemically bind a fiber reinforcement material with the polymer, citing a number of paragraphs therein in making the rejection. Applicants respectfully assert that the Examiner has established neither *prima facie* anticipation or obviousness in the instant Office Action. As established hereinbelow, there are multiple teachings demonstrating that *Ton-That* does not, in fact, teach or suggest a polymer composite in which carbon nanotubes chemically bind a polymer to a fiber reinforcement material.

Ton-That teaches nanocomposites comprising a nano-reinforcing material, a polymer matrix, and an epoxy-functionalized graft polymer compatible with the polymer matrix (see *Ton-That*, Abstract and paragraph [0014]). *Ton-That* further teaches that the nano-reinforcing

material may be carbon nanotubes (see *Ton-That*, paragraph [0028]) and that the nano-reinforcing material may be treated with organophilic modifying compounds (e.g., silanes) to enhance physical and chemical interaction with the epoxy-group of the epoxy-functionalized graft polymer (see *Ton-That*, paragraph [0029]). Finally, *Ton-That* teaches that the nanocomposites may also include additives normally used in polymers such as fibers (see *Ton-That*, paragraph [0078]).

Although the above teachings of *Ton-That* do teach fibers in a nanocomposite, Applicants foremost respectfully assert that *Ton-That* does not teach or suggest that the fibers are chemically bonded to the carbon nanotubes or otherwise functionalized in any way. Since the fibers of *Ton-That* are not chemically bonded to carbon nanotubes or otherwise functionalized, it follows that *Ton-That* does not teach or suggest that the fibers are chemically bonded to the polymer matrix through the carbon nanotubes, as required by claim 41.

Furthermore, it is not evident from the teachings of *Ton-That* that the epoxy-functionalized graft polymer is chemically bonded to the polymer matrix either. *Ton-That* expressly teaches that the epoxy-functionalized graft polymer has a matrix compatible portion and an epoxy-functionalized portion (see *Ton-That*, paragraph [0052]). *Ton-That* expressly defines the term "compatible" as follows in paragraph [0013] (emphasis added):

In the context of the above discussion, compatibilizers means an agent capable of interacting with hydrophobic nano-reinforcing materials and at the same time being miscible or thermodynamically compatible with hydrophobic polymer matrices. In this the present application, the word "compatible" is used to indicate either a thermodynamic miscibility of the organic components or positive interactions between the organic and inorganic components, which results in a non-positive value of the free energy of mixing.

In view of this express definition of the term "compatible", Applicants respectfully assert that *Ton-That* does not teach or suggest that the epoxy-functionalized graft polymer is bonded to the polymer matrix. Thermodynamic miscibility or positive interactions do not equate to chemical bonding. Accordingly, *Ton-That*, at most, teaches that the epoxy-functionalized graft polymer is bound to the nano-reinforcing material, and *Ton-That* does not teach or suggest the limitation of claim 41 requiring carbon nanotubes to chemically bind the fiber-reinforcement material with the polymer.

In view of the foregoing remarks, Applicants respectfully assert that independent claim 41 is not anticipated or rendered obvious by *Ton-That*, since all claim limitations are not taught or suggested. Claims 42 – 49, 68 and 69 depend either directly or indirectly from patentable claim 41 and are patentable for at least the same reasons. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). Therefore, Applicants respectfully request that the Examiner's rejection of claims 41, 42, 45 and 47 under 35 U.S.C. § 102(e)/103(a) be withdrawn.

II.3.1 Withdrawn Claims 50 – 67, 71 and 72 Are Not Anticipated or Obvious

Applicants also respectfully assert that withdrawn claims 50 – 67, 71 and 72 are not anticipated or rendered obvious by *Ton-That*, since all of the limitations of independent claim 50 are not taught or suggested. Specifically, *Ton-That* does not teach or suggest a method in which carbon nanotubes chemically bind a fiber reinforcement material with a polymer material. Applicants' remarks presented hereinabove are reiterated *in toto* with respect to withdrawn claim 50.

Furthermore, Applicants respectfully assert that *Ton-That* does not teach or suggest a method in which carbon nanotube-coated fibers are formed, as required by claim 50. *Ton-That* is silent regarding coating of the fibers.

In view of the foregoing remarks, Applicants respectfully assert independent claim 50 is not anticipated or rendered obvious by *Ton-That*, since all claim limitations are not taught or suggested. Claims 51 – 67, 71 and 72 depend either directly or indirectly from patentable claim 50 and are patentable for at least the same reasons.

III. 35 U.S.C. § 103 Rejections

III.1 Claim 43 Rejected Over Ton-That In View Of Ajayan

Claim 43 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over *Ton-That* in view of Ajayan, *et al.*, "Single-Walled Carbon Nanotube-Polymer Composites: Strength and Weakness", *Adv. Mater.*, 12:2000, pp. 750-753 (hereinafter, *Ajayan*). Office Action page 5, item 9. Applicants respectfully traverse the rejection of this claim.

III.1.1 Examiner's Grounds for Rejection

The Examiner applies *Ton-That* as set forth hereinabove and further alleges that *Ajayan* teaches single-walled carbon nanotubes, which are not taught by *Ton-That*. The Examiner alleges that *Ajayan* teaches epoxy composites containing single-walled carbon nanotubes. The Examiner alleges that it would have been obvious to one of ordinary skill in the art to combine *Ajayan* with *Ton-That* in view of increased composite toughness obtained in doing so.

III.1.2 Claim 43 is Not Obvious

Applicants respectfully assert that claim 43 is not obvious, since claim 41, from which claim 43 depends is not obvious in view of *Ton-That* and *Ajayan*. Specifically, *Ton-That* and *Ajayan* do not teach or suggest all of the limitations of claim 41 in combination. As set forth in detail hereinabove, Applicants respectfully assert that *Ton-That* does not teach or suggest a polymer composite in which the carbon nanotubes chemically bind the polymer to the fiber reinforcement material. At most, *Ton-That* teaches an epoxy-functionalized graft polymer that is bound to a nano-reinforcing material, not a fiber reinforcement material.

Applicants respectfully assert that *Ajayan* fails to remedy the deficiencies of *Ton-That*, since *Ajayan* also fails to teach or suggest a polymer composite in which carbon nanotubes chemically bind a polymer to a fiber reinforcement material. Specifically, *Ajayan* is silent on the presence of a fiber reinforcement material in the composites. Hence, it follows that *Ajayan* cannot teach a polymer composite in which carbon nanotubes chemically bind a fiber reinforcement material with the polymer. Although *Ajayan* teaches functionalizing carbon nanotubes and chemically bonding them to a polymer (see *Ajayan*, page 753, Col. 1, last sentence of first full paragraph), *Ajayan* in no way teaches or suggests chemically bonding the carbon nanotubes to a fiber reinforcement material.

In view of the foregoing remarks, Applicants respectfully assert that independent claim 41 is not obvious in view of *Ton-That* and *Ajayan*, since all claim limitations are not taught or suggested. Claims 42 – 49, 68 and 69 depend either directly or indirectly from non-obvious claim 41 and are not obvious for at least the same reasons. Therefore, Applicants respectfully request that the Examiner's rejection of claim 43 under 35 U.S.C. § 103(a) be withdrawn.

III.1.3 Withdrawn Claims 50 – 67, 71 and 72 Are Not Obvious

Applicants also respectfully assert that withdrawn claims 50 – 67, 71 and 72 are not obvious in view of *Ton-That* and *Ajayan*, since all of the limitations of independent claim 50 are not taught or suggested. Specifically, *Ton-That* and *Ajayan* do not teach or suggest a method in which carbon nanotubes chemically bind a fiber reinforcement material with a polymer material. Applicants' remarks presented hereinabove are reiterated *in toto* with respect to withdrawn claim 50.

In view of the foregoing remarks, Applicants respectfully assert that independent claim 50 is not rendered obvious by *Ton-That* and *Ajayan*, since all claim limitations are not taught or suggested. Claims 51 – 67, 71 and 72 depend either directly or indirectly from patentable claim 50 and are patentable for at least the same reasons.

III.2 Claims 44 and 46 Rejected Over Ton-That In View Of Flautt

Claims 44 and 46 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Ton-That* in view of United States Patent 6,270,897 (hereinafter, *Flautt*). Office Action page 6, item 10. Applicants respectfully traverse the rejection of these claims.

III.2.1 Examiner's Grounds for Rejection

The Examiner applies *Ton-That* as set forth hereinabove. The Examiner acknowledges that *Ton-That* does not teach or suggest silane functionalization of the fiber or resizing with an organosilane species. However, the Examiner alleges that *Flautt* teaches sizing glass fibers with an organosilane species to reduce interfilament abrasion and improve compatibility of the fibers with an epoxy matrix. The Examiner alleges that it would have been obvious to one of ordinary skill in the art to use glass fibers sized with an organosilane, as taught by *Flautt*, in the composite material of *Ton-That*, in view of the decreased interfilament abrasion and improved compatibility.

III.2.2 Claims 44 and 46 Are Not Obvious

Applicants respectfully assert that claims 44 and 46 are not obvious, since claim 41, from which claims 44 and 46 depend are not obvious in view of *Ton-That* and *Flaufft*. Specifically, *Ton-That* and *Flaufft* do not teach or suggest all of the limitations of claim 41 in combination. As set forth in detail hereinabove, Applicants respectfully assert that *Ton-That* does not teach or suggest a polymer composite in which the carbon nanotubes chemically bind the polymer to the fiber reinforcement material. At most, *Ton-That* teaches an epoxy-functionalized graft polymer that is bound to a nano-reinforcing material, not a fiber reinforcement material.

Applicants respectfully assert that *Flaufft* fails to remedy the deficiencies of *Ton-That*, since *Flaufft* also fails to teach or suggest a polymer composite in which carbon nanotubes chemically bind a polymer to a fiber reinforcement material. *Flaufft* is silent regarding carbon nanotubes. Hence, it follows that *Flaufft* also does not teach or suggest a polymer composite in which carbon nanotubes chemically bind a fiber reinforcement material with the polymer.

In view of the foregoing remarks, Applicants respectfully assert that independent claim 41 is not obvious in view of *Ton-That* and *Flaufft*, since all claim limitations are not taught or suggested. Claims 42 – 49, 68 and 69 depend either directly or indirectly from non-obvious claim 41 and are not obvious for at least the same reasons. Therefore, Applicants respectfully request that the Examiner's rejection of claims 44 and 46 under 35 U.S.C. § 103(a) be withdrawn.

III.2.3 Withdrawn Claims 50 – 67, 71 and 72 Are Not Obvious

Applicants also respectfully assert that withdrawn claims 50 – 67, 71 and 72 are not obvious in view of *Ton-That* and *Flaufft*, since all of the limitations of independent claim 50 are not taught or suggested. Specifically, *Ton-That* and *Flaufft* do not teach or suggest a method in which carbon nanotubes chemically bind a fiber reinforcement material with a polymer material. Applicants' remarks presented above are reiterated *in toto* with respect to withdrawn claim 50.

In view of the foregoing remarks, Applicants respectfully assert that independent claim 50 is not rendered obvious by *Ton-That* and *Flaufft*, since all claim limitations are not taught or

suggested. Claims 51 – 67, 71 and 72 depend either directly or indirectly from patentable claim 50 and are patentable for at least the same reasons.

III.3 Claims 48 and 49 Rejected Over Ton-That In View Of Phillips

Claims 48 and 49 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Ton-That* in view of United States Patent 3,312,569 (hereinafter, *Philipps*). Office Action page 7, item 11. Applicants respectfully traverse the rejection of this claim.

III.3.1 Examiner's Grounds for Rejection

The Examiner applies *Ton-That* as set forth hereinabove. The Examiner acknowledges that *Ton-That* does not teach or suggest woven sheets or stacking of woven sheets with carbon nanotubes and polymer between them. However, the Examiner alleges that *Philipps* teaches woven mats of glass fiber. The Examiner alleges that it would have been obvious to one of ordinary skill in the art to form the reinforced composite of *Ton-That* using the woven sheets of *Philipps*, motivated by increased dimensional stability.

III.3.2 Claims 48 and 49 Are Not Obvious

Applicants respectfully assert that claims 48 and 49 are not obvious, since claim 41, from which claims 48 and 49 depend are not obvious in view of *Ton-That* and *Philipps*. Specifically, *Ton-That* and *Philipps* do not teach or suggest all of the limitations of claim 41 in combination. As set forth in detail hereinabove, Applicants respectfully assert that *Ton-That* does not teach or suggest a polymer composite in which the carbon nanotubes chemically bind the polymer to the fiber reinforcement material. At most, *Ton-That* teaches an epoxy-functionalized graft polymer that is bound to a nano-reinforcing material, not a fiber reinforcement material.

Applicants respectfully assert that *Philipps* fails to remedy the deficiencies of *Ton-That*, since *Philipps* also fails to teach or suggest a polymer composite in which carbon nanotubes chemically bind a polymer to a fiber reinforcement material. *Philipps* is silent regarding carbon nanotubes. Hence, it follows that *Philipps* also does not teach or suggest cannot teach a polymer composite in which carbon nanotubes chemically bind a fiber reinforcement material with the polymer.

In view of the foregoing remarks, Applicants respectfully assert independent claim 41 is not obvious in view of *Ton-That* and *Philips*, since all claim limitations are not taught or suggested. Claims 42 – 49 and 68 – 70 depend either directly or indirectly from non-obvious claim 41 and are not obvious for at least the same reasons. Therefore, Applicants respectfully request that the Examiner's rejection of claims 48 and 49 under 35 U.S.C. § 103(a) be withdrawn.

III.3.3 Withdrawn Claims 50 – 67 and 71 – 73 Are Not Obvious

Applicant also respectfully assert that withdrawn claims 50 – 67 and 71 – 73 are not obvious in view of *Ton-That* and *Philips*, since all of the limitations of independent claim 50 are not taught or suggested. Specifically, *Ton-That* and *Philips* do not teach or suggest a method in which carbon nanotubes chemically bind a fiber reinforcement material with a polymer material. Applicants' remarks presented above are reiterated *in toto* with respect to withdrawn claim 50.

In view of the foregoing remarks, Applicants respectfully assert independent claim 50 is not rendered obvious by *Ton-That* and *Philips*, since all claim limitations are not taught or suggested. Claims 51 – 67 and 71 – 73 depend either directly or indirectly from patentable claim 50 and are patentable for at least the same reasons.

III.4 Claims 68 – 70 Rejected Over Ton-That In View Of Velasco-Santos

Claims 68 – 70 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Ton-That* in view of *Velasco-Santos, et al.*, "Chemical Functionalization of Carbon Nanotubes Through an Organosilane", *Nanotechnology*, 13:2002, pp. 495-498 (hereinafter, *Velasco-Santos*). Office Action page 8, item 12. Applicants respectfully traverse the rejection of these claims.

III.4.1 Examiner's Grounds for Rejection

The Examiner applies *Ton-That* as set forth hereinabove. The Examiner acknowledges that *Ton-That* does not teach or suggest the specific formula of silane-functionalized carbon nanotubes. However, the Examiner alleges that *Velasco-Santos* teaches carbon nanotubes that

are silane functionalized by reacting a hydroxyl group on the nanotube surface with a silane coupling agent. The Examiner alleges that it would have been obvious to one of ordinary skill in the art to form the reinforced composite of *Ton-That* using the organo-functionalized carbon nanotubes of *Velasco-Santos*, motivated by improved chemical compatibility obtained therefrom. The Examiner further alleges that it would have been obvious to choose a suitable R group to be reactive with an epoxy matrix.

III.4.2 Claims 68 and 69 Are Not Obvious

Applicants respectfully assert that claims 68 and 69 are not obvious, since claim 41, from which claims 68 and 69 depend are not obvious in view of *Ton-That* and *Velasco-Santos*. Specifically, *Ton-That* and *Velasco-Santos* do not teach or suggest all of the limitations of claim 41 in combination. As set forth in detail hereinabove, Applicants respectfully assert that *Ton-That* does not teach or suggest a polymer composite in which the carbon nanotubes chemically bind the polymer to a fiber reinforcement material. At most, *Ton-That* teaches an epoxy-functionalized graft polymer that is bound to a nano-reinforcing material, not a fiber reinforcement material.

Applicants respectfully assert that *Velasco-Santos* fails to remedy the deficiencies of *Ton-That*, since *Velasco-Santos* also fails to teach or suggest a polymer composite in which carbon nanotubes chemically bind a polymer to a fiber reinforcement material. *Velasco-Santos* is silent regarding a fiber reinforcement material. Hence, it follows that *Velasco-Santos* cannot teach a polymer composite in which carbon nanotubes chemically bind a fiber reinforcement material with the polymer.

Furthermore, *Velasco-Santos* does not teach or suggest the specific carbon nanotubes now recited in claim 68. Claim 68 now requires that the carbon nanotubes are hydroxyl-functionalized carbon nanotubes that have been further silane functionalized. The hydroxyl-functionalized carbon nanotubes are formed from fluorinated carbon nanotubes by reacting a reagent selected from the group consisting of a mono-metal salt of a dialcohol, a mono-metal salt of a multi-alcohol, and an amino alcohol. In contrast, *Velasco-Santos* teaches hydroxyl-functionalized carbon nanotubes that have been surface oxidized to produce hydroxyl groups (see *Velasco-Santos*, page 496, Col. 1, first paragraph). Applicants respectfully assert that one of

ordinary skill in the art will recognize that the hydroxyl-functionalized carbon nanotubes of claim 68 and those taught by *Velasco-Santos* are different and not obvious variants of one another.

In view of the foregoing remarks, Applicants respectfully assert that independent claim 41 is not obvious in view of *Ton-That* and *Velasco-Santos*, since all claim limitations are not taught or suggested. Claims 42 – 49, 68 and 69 depend either directly or indirectly from non-obvious claim 41 and are not obvious for at least the same reasons. Therefore, Applicants respectfully request that the Examiner's rejection of claims 68 – 70 under 35 U.S.C. § 103(a) be withdrawn.

III.4.3 Withdrawn Claims 50 – 67, 71 and 72 Are Not Obvious

Applicants also respectfully assert that withdrawn claims 50 – 67, 71 and 72 are not obvious in view of *Ton-That* and *Velasco-Santos*, since all of the limitations of independent claim 50 are not taught or suggested. Specifically, *Ton-That* and *Velasco-Santos* do not teach or suggest a method in which carbon nanotubes chemically bind a fiber reinforcement material with a polymer material. Applicants' remarks presented above are reiterated *in toto* with respect to withdrawn claim 50.

In view of the foregoing remarks, Applicants respectfully assert that independent claim 50 is not rendered obvious by *Ton-That* and *Velasco-Santos*, since all claim limitations are not taught or suggested. Claims 51 – 67, 71 and 72 depend either directly or indirectly from patentable claim 50 and are patentable for at least the same reasons.

III.5 Claims 68 – 70 Rejected Over Ton-That In View Of Applicants' Specification and Velasco-Santos

Claims 68 – 70 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Ton-That* in view of *Velasco-Santos* and Applicants' specification. Office Action page 10, item 13. Applicants respectfully traverse the rejection of these claims.

III.5.1 Examiner's Grounds for Rejection

The Examiner applies *Ton-That* and *Velasco-Santos* as set forth hereinabove. The Examiner further alleges that Figures 1 and 2 include admitted prior art for hydroxyl-functionalized carbon nanotubes. The Examiner alleges that it would have been obvious to one of ordinary skill in the art to form the reinforced composite of *Ton-That* using the organo-functionalized carbon nanotubes of *Velasco-Santos* made from hydroxyl-functionalized carbon nanotubes of Applicants' specification, motivated by improved chemical compatibility obtained therefrom.

III.5.2 Claims 68 and 69 Are Not Obvious

Applicants respectfully assert that claims 68 and 69 are not obvious in view of *Ton-That*, *Velasco-Santos* and Applicants' specification, since all of the limitations of claim 41 are not taught or suggested by the cited references. As discussed hereinabove, claim 41 is not obvious in view of *Ton-That* and *Velasco-Santos*, and Applicants' remarks in that regard are reiterated *in toto*. Applicants respectfully assert that the specification does not contain admitted prior art that remedies the deficiencies of *Ton-That* and *Velasco-Santos* in regard to the limitations of claim 41.

Applicants also respectfully submit that Applicants' specification contains no admitted prior art with regard to silane-functionalization of the hydroxyl-functionalized carbon nanotubes of Figures 1 and 2. As noted above in Applicants' discussion regarding *Ton-That* and *Velasco-Santos*, Applicants submit that one of ordinary skill in the art would recognize that the hydroxyl-functionalized carbon nanotubes of *Velasco-Santos* are not the same as the hydroxyl-functionalized carbon nanotubes now recited in claim 68. As the hydroxyl-functionalized carbon nanotubes of *Velasco-Santos* and those claimed by Applicants are completely different structures, Applicants respectfully assert that one of ordinary skill in the art would not be able to predict the outcome of reacting a silation reagent with the hydroxyl-functionalized carbon nanotubes of Applicants' disclosure.

In view of the foregoing remarks, Applicants respectfully assert independent claim 41 is not obvious in view of *Ton-That*, *Velasco-Santos* and the specification, since all claim limitations are not taught or suggested. Claims 42 – 49, 68 and 69 depend either directly or indirectly from

non-obvious claim 41 and are not obvious for at least the same reasons. Therefore, Applicants respectfully request that the Examiner's rejection of claims 68 – 70 under 35 U.S.C. § 103(a) be withdrawn.

III.5.3 Withdrawn Claims 50 – 67, 71 and 72 Are Not Obvious

Applicants also respectfully assert that withdrawn claims 50 – 67, 71 and 72 are not obvious in view of *Ton-That, Velasco-Santos* and the specification, since all of the limitations of independent claim 50 are not taught or suggested. Specifically, *Ton-That* and *Velasco-Santos* do not teach or suggest a method in which carbon nanotubes chemically bind a fiber reinforcement material with a polymer material. Applicants respectfully assert that the specification does not contain admitted prior art that remedies the deficiencies of *Ton-That* and *Velasco-Santos* in regard to the limitations of withdrawn claim 50. Applicants' remarks presented above are reiterated *in toto* with respect to withdrawn claim 50.

In view of the foregoing remarks, Applicants respectfully assert that independent claim 50 is not rendered obvious by *Ton-That, Velasco-Santos* and the specification, since all claim limitations are not taught or suggested. Claims 51 – 67, 71 and 72 depend either directly or indirectly from patentable claim 50 and are patentable for at least the same reasons.

CONCLUSIONS

Claims 41 – 49, 68 and 69 are now presently pending in the application. Applicants respectfully submit that claims 41 – 49, 68 and 69, as these claims presently stand amended, are in a condition for allowance based on the remarks presented hereinabove. Furthermore, Applicants respectfully request that withdrawn method claims 50 – 67, 71 and 72 be considered for rejoinder upon allowance of one or more claims from claims 41 – 49, 68 and 69, as required in MPEP 821.04.

The Director is hereby authorized to charge any fees or credit any overpayment due to Deposit Account Number 23-2426 of Winstead PC (referencing matter number 11321-P074WOUS).

ATTORNEY DOCKET NO.
11321/P074WOUS

PATENT
U.S. Ser. No. 10/576,134

If the Examiner has any questions or comments concerning this paper or the present application in general, the Examiner is invited to call the undersigned at (713) 650-2663.

Respectfully submitted,

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